

EOC Compatibility Test 1

(ECT1)

Test Package

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EOC Compatibility Test 1 - ECT1

Background Information:

ECT1 is the first in a series of 3 ground system compatibility tests for the AM-1 spacecraft. These tests gradually add more elements and functionality in preparation for the AM-1 End-to-End Test. (AM-1 ETE)

Test Objectives:

The first EOC Compatibility Test (ECT) test is an initial command and telemetry test with the spacecraft at the SCS in Valley Forge, Pa. The communications for this test will be with base-band data over land-line circuits. The following objectives have been established for ECT1:

Primary Objectives:

- Demonstrate that the EBnet circuits can reliably support data communications between the SCS, EDOS, and the EOC.
- Demonstrate that EDOS can perform data capture and real time packet processing of 16 kbps housekeeping telemetry and 1 kbps health and safety telemetry.
- Demonstrate that EDOS can perform forward link processing of command data at 1 kbps, 2 kbps, and 10 kbps. [Note: 2kbps contingency mode commanding is what the hard-line forward link is optimized for].
- Demonstrate that the EOC can perform telemetry decommutation, limit checking, EU conversion and display for both 16 kbps housekeeping data and 1 kbps health and safety data from the AM-1 spacecraft.
- Demonstrate that the EOC can perform simple real-time commanding of the AM-1 spacecraft.

Commanding activities for ECT1 will be limited to real time commands from ECL directives using the CCSDS PLOP-1 protocol (one CLTU per command block)

Commanding will be performed at the 1 kbps, 2kbps and 10 kbps uplink rates

Secondary Objectives:

- Demonstrate that the EOC can maintain telemetry display update rates.

Pages will be set to update at 2 second rates while processing 16 kbps telemetry

Test Configuration:

The overall communications configuration to support ECT1 is shown in Figures 1-4 below. Figure 1 is the overview configuration, Figure 2 shows the data paths and processing elements within the EOC, Figure 3 shows the spacecraft, SCS, and data paths at LMMSC-VFPA, and Figure 4 shows the EDOS Version 2 configuration.

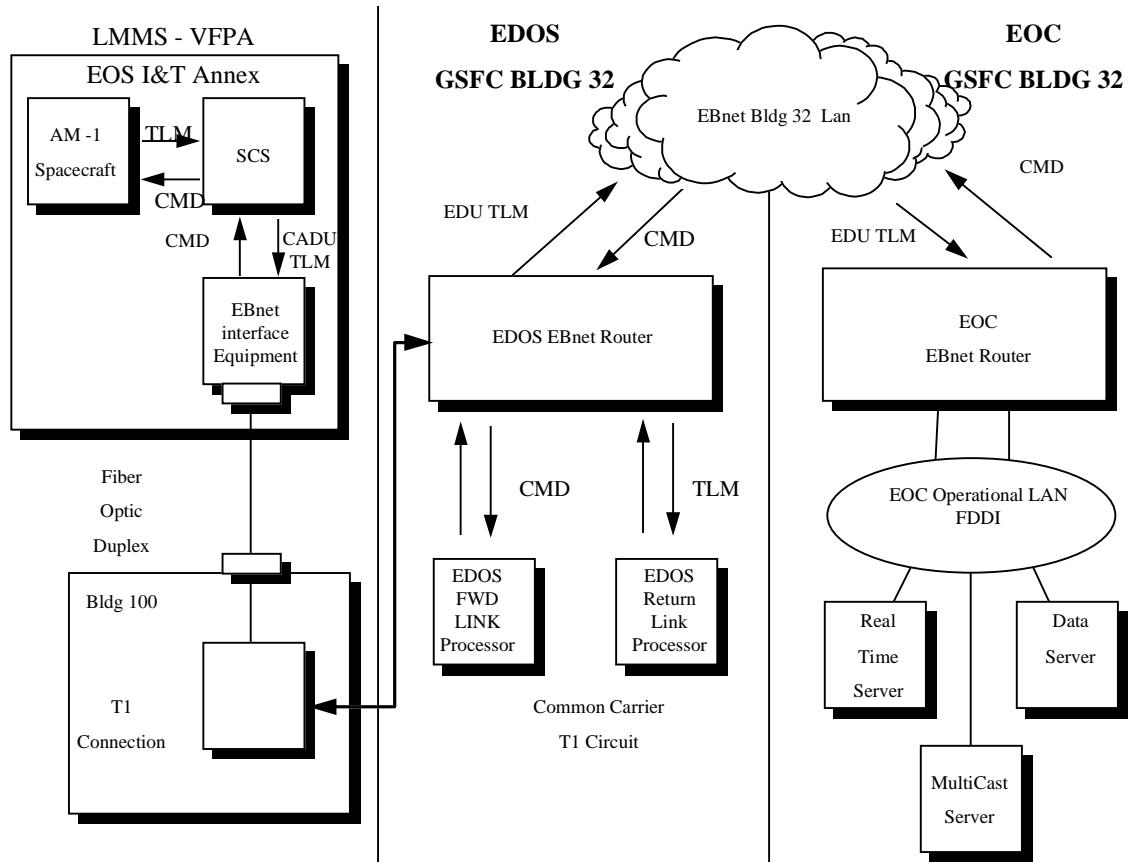


Figure 1: Overview ECT1 Communications Configuration

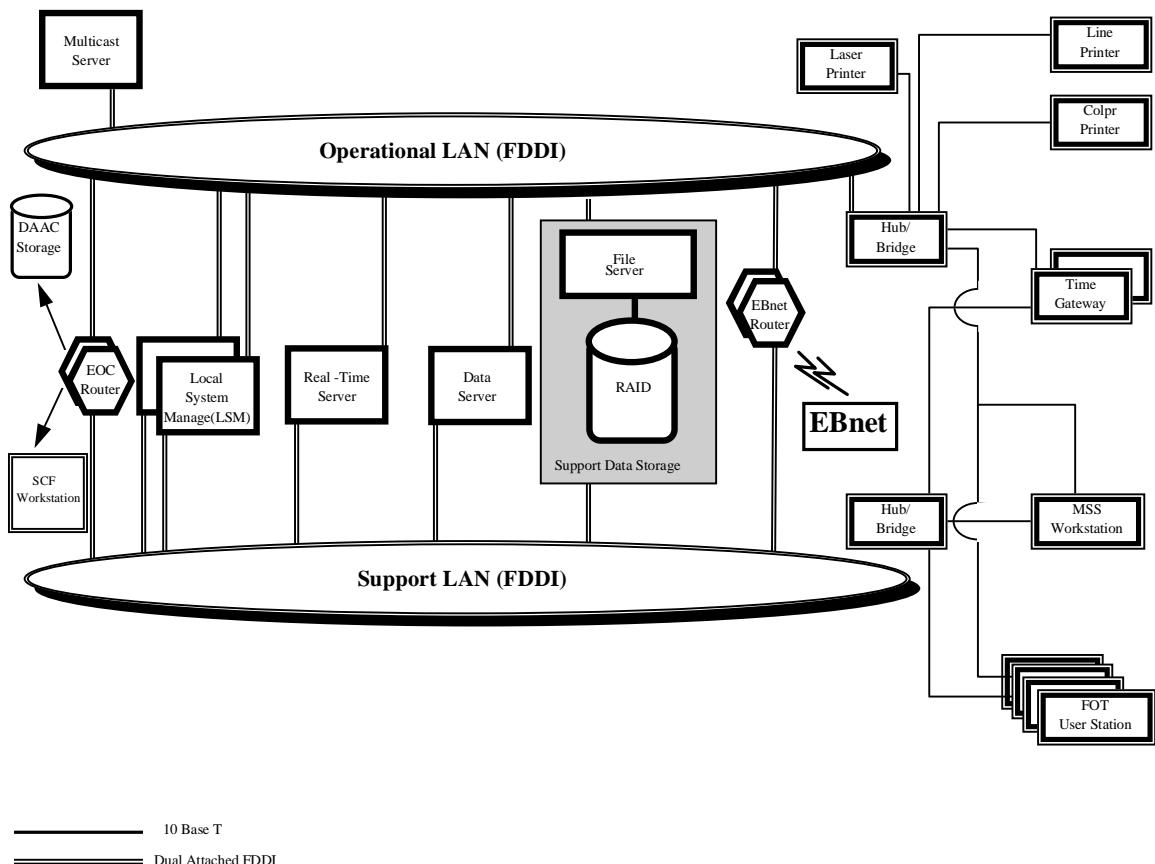


Figure 2: EOC Configuration for ECT1 (FOS Release A)

LMMS VF Spacecraft I&T

Data / Voice Communications Paths

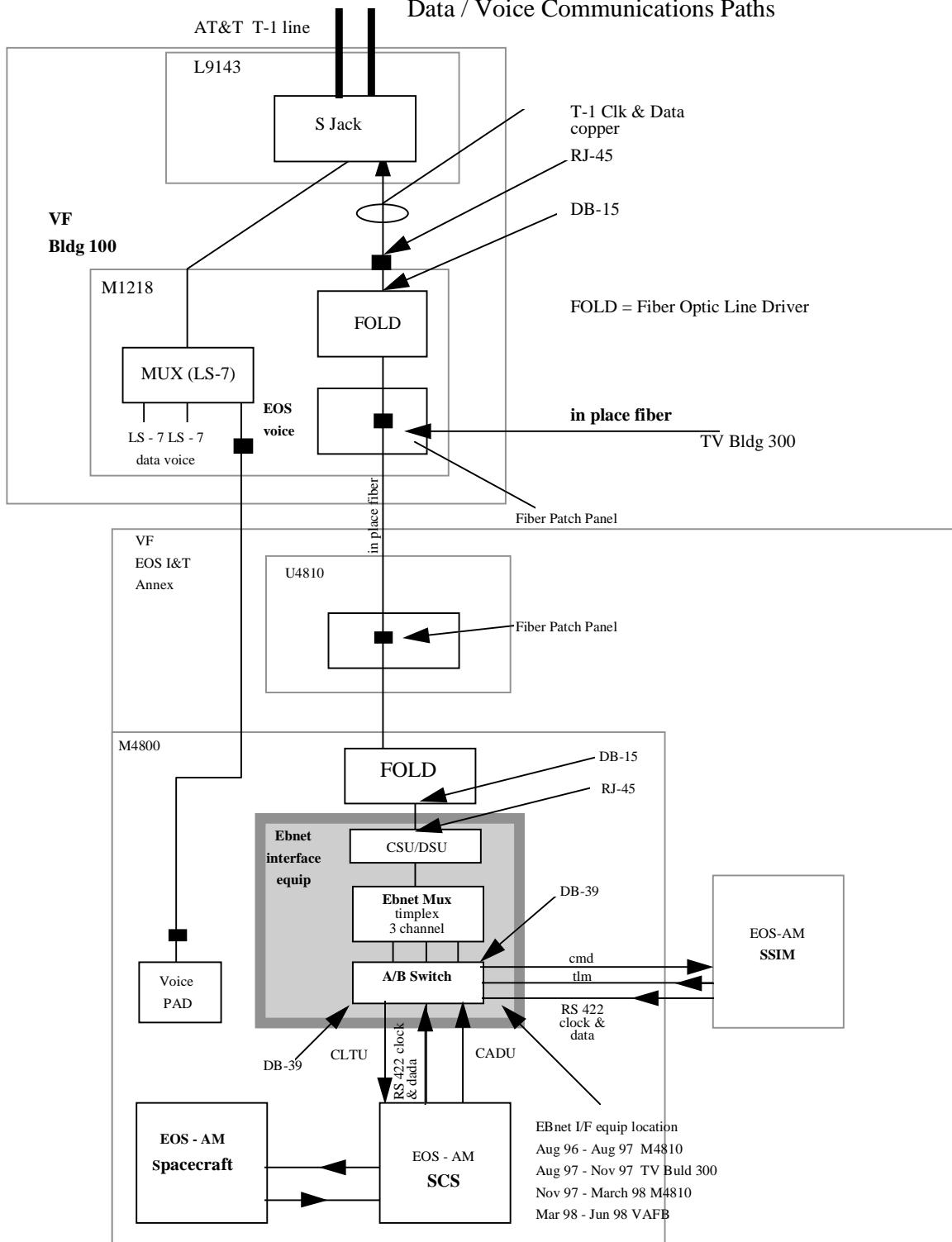


Figure 3 - Test Configuration at LMMSC - VFPA

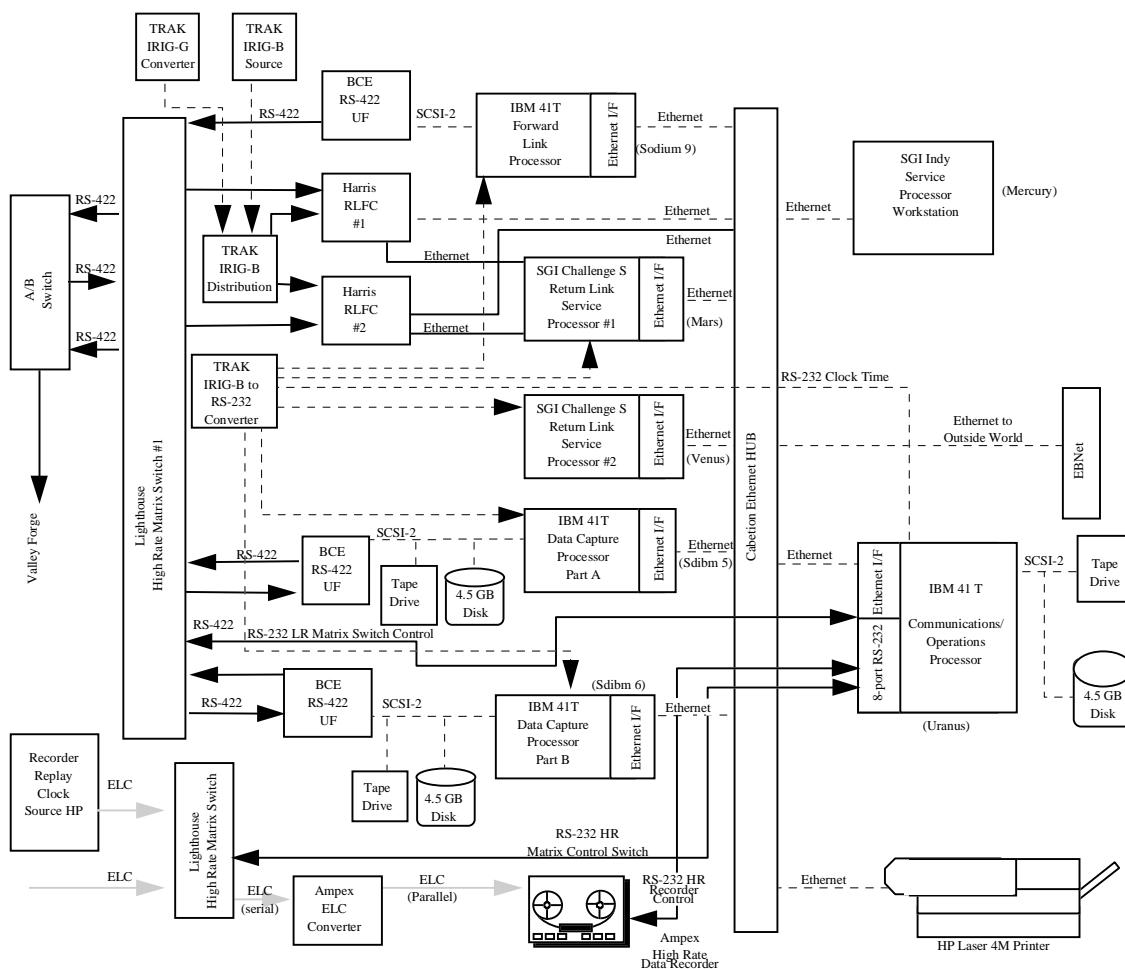


Figure 4 - EDOS Version 2 Configuration

Participants and Support Requirements:

Participants:

Lockheed - Martin:	LMMS-VF	Spacecraft I&T Spacecraft Operations
	LMSMS	FOT/Greenbelt FOS Development/Landover
TRW:	EDOS Developer Support	
AlliedSignal (CNMOS)	EDOS Operations	
CSC (CNMOS)	EDOS I&T	
GSFC 540	EBnet Operations Nascom Voice Operations	
GSFC 505	EGS Test Director	

Communications:

Voice: SCAMA drop to Spacecraft Checkout Station (SCS) (designation - **TBD**)
SCAMA drop to EDOS FLP/LZPS (designation - **TBD**)
SCAMA drop to EOC (designation - **TBD**)
Building 32 CCL (??) - EOC - EDOS voice link (??)

“Black phone” numbers:
SCS - I&T Annex VFPA 610-354-7920 / 7937
Building 100 VFPA 610-
EDOS Operations Area 301-
EBnet Operations Area 301-
AM-1 Operations Area (EOC) 301-

Data: EBnet connection to Spacecraft Checkout Station (IP address **TBD**)
EBnet - EDOS connection (IP address **TBD**)
EBnet - EOC connection (IP address **TBD**)

AT&T T1 circuit - VFPA - GSFC (designation **TBD**)

Equipment and Software:

EOC: Equipment to support command and telemetry logical strings

Real Time Server

Data Server

Workstation for Command Activity Controller

Workstation for Spacecraft Evaluator

User Interface Sub-system software

Telemetry Sub-system software

Command and Command Management Sub-system software

Resource Management Sub-system software

Project Data Base

EDOS

Return Link Processor (RLP) with Version 2 software

Forward Link Processor (FLP) with Version 2 software

AM-1 Spacecraft I&T Facility

AM-1 Spacecraft (Communications / C&DH Module)

Spacecraft Checkout Station

EBnet Interface Equipment

Test Tools - **TBD**

Test Data:

Description / Characteristics	Source	File/script name & Location
AM-1 Spacecraft Commands (Command Rates 1 kbps, 2 kbps and 10 kbps)	FOT	
AM-1 Spacecraft Housekeeping Telemetry (16 kbps)	AM-1 Spacecraft	
AM-1 health and safety telemetry (1 kbps)	AM-1 Spacecraft	

Test Script:

High level test procedure generation will start when the timeline is finalized and continue as detailed SCS console procedures and EOC detailed procedures are developed.

Timeline Event	Description	SCS / EOC supporting steps	Comments / Notes
1.	Test initiation: Pre-test briefing, also checks voice links circuit checks via Unix ping Verify EOC, EDOS, SCS ready		EOC, EDOS should be configured to accept 16 kbps housekeeping telemetry on the I channel.
2.	Power up the AM-1 Spacecraft, configured to transmit 16 kbps telemetry on both the I and Q channels and to receive commands via the launch umbilical at 2 kbps.		
3.	Transmit 16 kbps housekeeping telemetry on the I channel, controlled from the SCS. Transmission will last 20 minutes.		EDOS confirms receipt of CADU and RLP synch up. EOC confirms receipt of EDU and TLM string processing.
4.	LOS for first		EDOS, EOC confirm LOS.

Timeline Event	Description	SCS / EOC supporting steps	Comments / Notes
	transmission. Turn off telemetry under SCS control.		
5.	Reconfigure the ground system to receive 16 kbps housekeeping telemetry on the Q channel.		EDOS switches input to RLP to Q channel. EOC switches string input to Q channel port.
6.	Transmit 16 kbps housekeeping telemetry on the Q channel, controlled from the SCS. Transmission will last 20 minutes.		EDOS confirms receipt of CADU and RLP synch up. EOC confirms receipt of EDU and TLM string processing.
7.	LOS for second transmission. Turn off telemetry under SCS control.		EDOS, EOC confirm LOS.
8.	Reconfigure the ground system to receive 16 kbps housekeeping telemetry on BOTH the I and Q channel.		EDOS switches input to RLP to two channel configuration. EOC switches string input to two channel configuration.
9.	Transmit 16 kbps housekeeping telemetry		EDOS confirms receipt of CADU and RLP synch up.

Timeline Event	Description	SCS / EOC supporting steps	Comments / Notes
	on the I and Q channels, controlled from the SCS. Transmission will last 20 minutes.		EOC confirms receipt of EDU and TLM string processing.
10.	LOS for third transmission. Turn off telemetry under SCS control.		EDOS, EOC confirm LOS.
11.	Reconfigure to transmit 1 kbps health and safety telemetry on the I channel under SCS control		SCS reconfigures the spacecraft. EDOS switches input to RLP to single channel configuration. EOC switches string input to I channel port.
12.	Transmit 1 kbps health and safety telemetry on the I channel, controlled from the SCS. Transmission will last 20 minutes.		EDOS confirms receipt of CADU and RLP synch up. EOC confirms receipt of EDU and TLM string processing.
13.	LOS for fourth transmission. Turn off telemetry under SCS		EDOS, EOC confirm LOS.

Timeline Event	Description	SCS / EOC supporting steps	Comments / Notes
14.	Reconfigure to transmit 16 kbps housekeeping telemetry on the Q channel under SCS control	SCS reconfigures the spacecraft. EDOS switches input to RLP to Q channel.	EOC switches string input to Q channel port. EDOS confirms receipt of CADU and RLP synch up.
15.	Transmit 16 kbps housekeeping telemetry on the Q channel, controlled from the SCS.		EOC confirms receipt of EDU and TLM string processing.
16.	Configure the EOC to send commands at 2 kbps.		INITIAL COMMANDING SHOULD BE AT 2 KBPS (OPTIMAL HARD LINE RATE) - IF RESULTS ARE SATISFACTORY AT 2KBPS, TRY 1 KBPS AND 10 KBPS.
17.	Reset the command counters on the spacecraft and at the EOC. On board command counter reset will be by Type BC command from the EOC.		Reset ground command FOP counter. Send command counter reset command to AM-1, verify execution in CLCW and end item telemetry [THIS COMMAND ISN'T ONE OF THE ONES RAY SENT US - LMMS WILL AUTHORIZE?]
18.	EOC executes approved ECT1 command sequence(s) at 2 kbps		SCS validates commands and forwards to spacecraft. CLCW and end-item verification returned in telemetry.

Timeline Event	Description	SCS / EOC supporting steps	Comments / Notes
19.	Reconfigure EOC to transmit commands at 10 kbps.		
20	EOC executes approved ECT1 command sequence(s) at 10 kbps	SCS validates commands and forwards to spacecraft. CLCW and end-item verification returned in telemetry.	
21.	LOS for fifth transmission. Turn off telemetry under SCS control.	EDOS, EOC confirm LOS.	
22.	Reconfigure to transmit 1 kbps health and safety telemetry on the I channel under SCS control	SCS reconfigures the spacecraft. EDOS switches input to RLP to single channel configuration. EOC switches string input to I channel port.	
23.	Reconfigure EOC to transmit commands at 1 kbps.		
25.	Transmit 1 kbps health and safety telemetry on the I channel, controlled from the SCS.	EDOS confirms receipt of CADU and RLP synch up. EOC confirms receipt of EDU and TLM string processing.	

Timeline Event	Description	SCS / EOC supporting steps	Comments / Notes
32.	EOC executes approved ECT1 command sequence(s) at 1 kbps	SCS validates commands and forwards to spacecraft. CLCW and end-item verification returned in telemetry.	
33.	LOS for final transmission. Turn off telemetry under SCS control.	EDOS, EOC confirm LOS. [SHOULD WE TRY COMMANDING AT THE 125 BPS CONTINGENCY RATE ALSO? SECONDARY OBJECTIVE?]	
34.	Test termination, Post test debrief		